Report to

CITY OF SEBASTOPOL
CALIFORNIA

on

IMPROVEMENTS TO THE INDUSTRIAL WASTE DISPOSAL SYSTEM

March 1974

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Boston NewYork PaloAlto Chicago NewHaven

c/c

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March 29, 1974

Mr. Paul Schoch
City Engineer
258 Petaluma Avenue
Sebastopol, California 95472

Dear Mr. Schoch:

We are pleased to submit the following report describing the improvements to the industrial waste disposal facility. This report includes a description of the proposed improvements, schematic layouts, and estimated construction costs. The improvements were developed with the advice of Mr. Donald Parmelee, President of Thornwaite-Parmelee, Inc., a special consultant on land disposal of wastewater.

This report was written by Mr. David C. Tedrow, Project Engineer, under the direction of Mr. Charles E. Pound, Project Manager.

We appreciate this opportunity to work with you and look forward to working with you on future projects.

Respectfully submitted,

METCALF & EDDY, Inc.

Franklin L. Burton

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Chapter 1
INTRODUCTION

BACKGROUND

The Sebastopol Industrial Waste Disposal Facility is located in the eastern part of the City of Sebastopol. The wastewater is generated by the Sebastopol Cooperative Cannery, Plant No. 1, and two privately owned apple processing canneries, the Barlow and Speas companies. These canneries process apples into sauce, juice, and concentrate. The complex has one industrial waste system that handles all industrial flows from the canneries. Sanitary waste is handled separately and is disposed of in the city's domestic system.

The industrial waste system is owned and operated by the City of Sebastopol and was constructed specifically for the canneries. This system, which was constructed in 1972, was a result of a decision to dispose of the effluent from the canneries by land application in lieu of expanding the domestic sewage treatment plant.

The disposal system was designed for a flow rate of 300,000 gallons per day (gpd) on a land area of 54 acres. The system was designed in 1971, and a temporary spray irrigation system was used during the 1971 canning season. The permanent system was ready for the 1972 canning season and some problems, mainly runoff and ponding, were encountered during that first season.

In February 1971, the North Coast Regional Water Quality Control Board (NCRWQCB) had issued waste discharge requirements, which stated that there shall be no direct discharge to the Laguna de Santa Rosa. Other provisions were that the disposal of waste shall not cause a pollution or nuisance.

Rains that occurred in the fall of 1972 breached a levee near the Laguna and a direct discharge, and hence a violation, was created. Repairs were made to correct this discharge situation; however, the ponding conditions continued.

In 1973, the canneries processed a bumper crop of apples. The canneries ran at full capacity, and the resulting peak wastewater flow was nearly twice the design rate of the land disposal site. From July 25 to August 31, 1973, the mean daily waste flow to the disposal site was 451,518 gpd, or 150 percent of design capacity. This excess of flow caused ponding and discharges to the Laguna and resulted in the issuance of Cleanup and Abatement Order No. 73-77.

Subsequently, the staff of the North Coast Regional Water Quality Control Board has indicated that they would consider treated wastewater discharges to tributaries of the Russian River only after September 30 and before May 15, provided they meet certain requirements. One criterion that is beyond the control of the canneries is that in order to discharge into a Russian River tributary, the flow in the river at Healdsburg must be at least 1,000 cubic feet per second (cfs).

From the historical record of the operation and performance of the disposal site, it is apparent that two improvements are needed. First, the flow to the site must be limited to

300,000 gpd or less, and second, a complete treatment system is needed so that only acceptable discharges to the Laguna occur.

A water conservation study* was made at each of the canneries and the results indicated that the daily flow volumes can be reduced to below 300,000 gpd. However, only after implementation of the corrective measures and operating experience can this be confirmed.

EXISTING WASTEWATER MANAGEMENT SYSTEM

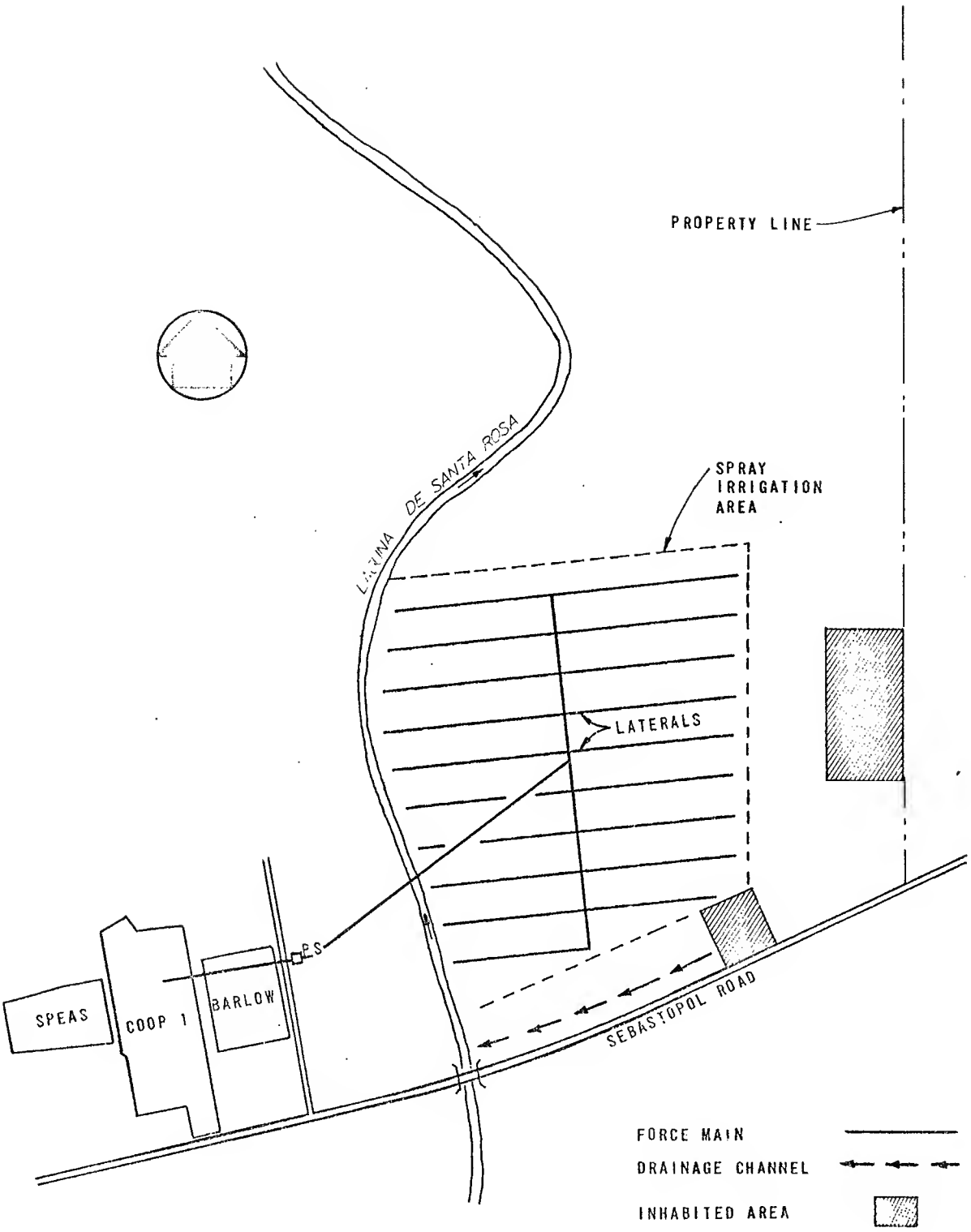
The existing wastewater treatment and disposal system consists of a Number 20 mesh disk screen, pumping facility, and a solid set sprinkler irrigation system. The system is shown schematically in Figure 1. The sprinkler heads are spaced on a 60-foot by 50-foot pattern over a 54-acre field. The field is nearly flat, with a gentle slope toward the Laguna de Santa Rosa. During peak discharge periods, the runoff reaches the Laguna or ponds in low areas near the Laguna.

The soil is clayey, with a slow percolation rate, throughout the field. When the peak flows are discharged, the discharge exceeds the consumptive use of the soil and cover crop and runoff occurs.

The present system was designed for a maximum daily flow of approximately 300,000 gpd, with the entire amount of water to be utilized by the plants and soil. This represents an application rate of about 0.20 inches per day, based on 100-percent usage of the 54 acres.

Present summer time operation is accomplished by using portions of the land for a period of time (2 days) and then letting the

*Eutek. IN-PLANT WATER USE SURVEY AND WATER CONSERVATION RECOMMENDATIONS. December 1973.



EXISTING SYSTEM
FIGURE 1

soil "dry out" or "rest" for a longer period (14 days). During the winter, the same operation cycle is used, and when rainfall floods the site, direct discharges of diluted wastewater to the Laguna occur. With only the sprinkler irrigation system, there is no provision for treating the wastewater before it reaches the Laguna. When the new discharge requirements are issued, this will be a necessity.

When the high wastewater flows of 1973 occurred, additional land was used to dispose of the wastewater with portable irrigation equipment. This land was more remote from the Laguna and direct discharge was avoided. However, during wet weather, runoff from the fields did reach the Laguna.

Chapter 2
RECOMMENDED WASTEWATER MANAGEMENT PLAN

The reduction or limitation of wastewater volume and provisions for treatment, storage, and flexibility are needed at this disposal site to ensure that violations do not occur. This chapter deals mainly with the changes needed in the land treatment system, since in-plant water conservation measures were presented in a report prepared by Eutek*.

The recommended improvements will be planned to meet the requirements of the Environmental Protection Agency (EPA) and the North Coast Regional Water Quality Control Board (NCRWQCB). The latter agency has not issued its discharge requirements in detail for this site, but a general staff recommendation is given below.

During the period from September 30 to May 15, discharge would be permitted to the Laguna, provided the quality of the treatment produces an effluent that meets the NCRWQCB requirements and provided there is adequate flow in the Russian River. The detailed discharge requirements will be issued after the completion of this report; however, they will be at least as stringent as the EPA's recommended requirements which are tabulated below:

Table 1. EPA RECOMMENDED REQUIREMENTS

	BOD_5, lb/1,000 lb[a]	Suspended solids, lb/1,000 lb
Best practicable standards, 7/1/77		
Apples: slices and sauce	0.35	0.25
Apples: juice	0.25	0.15
Best available standards, 7/1/83		
Apples: slices and sauce	0.07	0.04
Apples: juice	0.02	0.02

a. lb/1,000 lb = pounds of effluent per 1,000 pounds of raw material.

* Eutek. IN-PLANT WATER USE SURVEY AND WATER CONSERVATION RECOMMENDATIONS. December 1973.

The EPA requirements are considered not sufficiently stringent for a discharge at this site. As an example, Co-op No. 1 has a nominal daily capacity of 360 tons or 720,000 pounds of apples. Using the best practicable standards, which are scheduled to be effective on July 1, 1977, the daily BOD_5 allowed would be 250 pounds (720 x 0.35). Using a flow rate of 300,000 gpd, the allowable concentration would be 100 mg/1. The NCRWQCB has already indicated that such concentrations are unacceptable and more stringent requirements will be issued.

To meet the proposed requirements of the EPA and the NCRWQCB, we recommend the construction of an overland flow treatment system and effluent storage system on land adjacent to the existing property. Provision will be made to recycle the flow if the treatment does not meet the requirements.

WATER CONSERVATION

A water-use and conservation study has recently been completed by George Wilson of Eutek for the Barlow and Speas companies and Sebastapol Co-op No. 1 canneries. The results of this study indicated areas in which water usage could be reduced for all three canneries. With these reductions, the total wastewater flow would be lessened. The study report provided a 2-year improvement program for achieving the reductions in flow. If the recommended alterations and improvements are made to the various processes, the wastewater flows should be as follows:

Maximum daily flow, 1974	293,000 gallons
Maximum daily flow, 1975	219,564 gallons

These flows represent a great reduction from the 1973 peak flow; however, only after the improvements are made and the processes are in operation can the actual flows be obtained.

ALTERNATIVE IMPROVEMENTS

Improvements are needed in the existing system to provide flexibility in operation and treatment of the wastewater to prevent violations of discharge requirements. This is particularly important during winter months when discharges must occur.

One method of disposal would be to purchase additional land and expand the existing spray irrigation system. This method would be fine during the summer months when the consumptive use of water by plants is high. During the winter months, the combination of rainfall and spray irrigation would overload the land and overland flow to the Laguna would occur. An assessment of the capabilities and limitations of this alternative is included on page 2-12.

Based on climate, soil, and topographic conditions at the Sebastopol disposal site, the best alternative for treatment and disposal of wastewater is an overland flow system coupled with the existing spray irrigation field. This system is capable of providing flexibility of operation for the summer and winter conditions and will produce an effluent of acceptable quality for discharge to the Laguna.

An overland flow system uses the land and cover plants as a treatment system. The land is sloped on a grade of 2 to 6 percent to a collection ditch at the lower end of the field. The wastewater is sprayed on the ground near the top end of the slope, flows over the ground surface toward the low end of the slope, and is collected in the collection channel. Treatment occurs as the wastewater flows through the ground cover, usually grass, and a portion of the water infiltrates into the soil and is used by the grass.

of the cover crop will be necessary and should be done as in the past. In general, the grass must be fertilized and tended like any grass crop to ensure maximum performance of the system.

Holding Ponds

The two holding ponds serve two purposes; one serves to temporarily hold water prior to treatment and the other serves as a storage reservoir for satisfactorily treated water until it can be released. Normally, water in excess of that applied to the irrigation field would be treated by passing it through the overland flow system and then to Holding Pond No. 2.

Holding Pond No. 1 will contain either untreated wastewater pumped directly from the canneries or runoff from the spray irrigation field pumped by Recycling Pumping Station No. 1. Holding Pond No. 2 will contain treated water pumped from the overland flow system by Recycling Pumping Station No. 2.

A drain from Holding Pond No. 2 to the Laguna would be built to provide for discharge of stored water that meets discharge requirements. The discharge will be controlled by a valve so that there is a positive shutoff. The discharge will be piped to the Laguna to avoid contamination from surface water.

The holding ponds should be built to the east of the existing spray irrigation system in the flood plain of the Laguna. There are strict requirements on construction of structures within the Laguna flood plain that should be considered in designing them. The requirements of the Sonoma County Engineering Advisory Committee for excavation and filling within the flood plain must be satisfied. The recommended height of the embankments is elevation 76 feet, which is considered the minimum safe level above flood stage. The integrity of the Laguna basin for storage of water is to be maintained.

Recycling Pumping Stations

Recycling Pumping Station No. 1 will pump irrigation runoff to Holding Pond No. 1 and prevent the runoff from reaching the Laguna. This station will have two 50-gpm submersible pumps in a 48-inch wetwell. Since this area is subject to flooding, all controls and electrical equipment will be suitable for total submergence.

Recycling Pumping Station No. 2 will pump effluent from the overland flow treatment facility to Holding Pond No. 2. This station could be operated in the winter time only when the effluent does not meet discharge requirements; however, to provide simplicity in operating procedures, the station should always discharge to Holding Pond No. 2. The station also will be equipped with submersible pumps and waterproof electrical equipment, since it is in the flood zone.

Recycling Pumping Station No. 3 will recycle the wastewater. This station will draw water out of either Holding Pond No. 1 or No. 2 and pump it to the overland flow site. The station will be equipped with two 100-gpm high-pressure pumps to give the distribution sprinklers the required pressure at the nozzles. Wastewater in Holding Pond No. 1 will be untreated wastewater that will be applied to the overland flow site. Holding Pond No. 2 will contain wastewater that has been treated by overland flow at least once, and must be stored for later release or recycling. Recycling to the field is desirable for maintaining plant growth.

A nutrient addition facility will be incorporated into the design of Recycling Pumping Station No. 3. The function of this facility will be to supply necessary nitrogen that is lacking in the effluent to the grasses and the biological mass of the overland flow system.

A liquid application system can be accurately metered into the wastewater flow. A schematic diagram of an anhydrous ammonia system is shown in Figure 4.

Runoff Collection Ditch

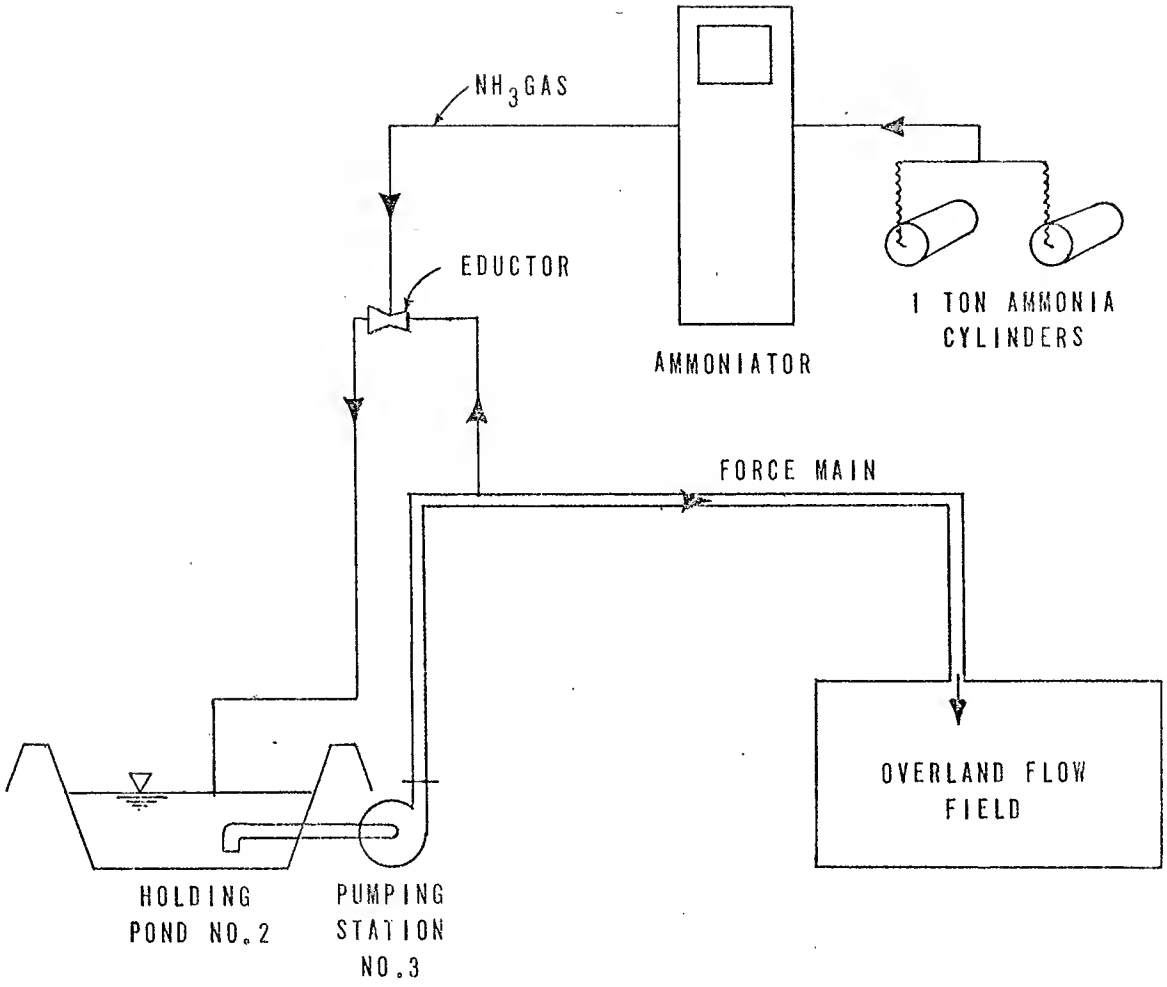
To prevent accidental discharge of water to the Laguna de Santa Rosa during the summer "no discharge" period, a collection ditch or channel system should be built between the site and the Laguna to intercept any surface flow. The channel system would connect to a pumping station which would pump the runoff to Holding Pond No. 1. The collection ditch should have adequate sidewalls to contain the flow and prevent seepage through the walls. The ditch bottom should be sloped uniformly to the pumping station to prevent ponding, with its accompanying nuisances.

Operations During Flooding

The proposed system is located in the flood plain of the Laguna de Santa Rosa. Whenever high water inundates the site either partially or wholly, operational changes must be made.

Recycling Pumping Station No. 1 will be the first part of the proposed system to be flooded, since it is lowest and closest to the Laguna. When this occurs, all wastewater will have to be pumped to the overland flow site or Holding Pond No. 1. The spray irrigation field and Pumping Station No. 1 will not be used.

If the water begins flooding the overland flow site (elevation approximately 65 feet), all wastewater must be diverted to the holding ponds. If the flood water rises higher than elevation 66,



NUTRIENT ADDITION
FIGURE 4

the entire system will be shut down because the existing pumping station will also be flooded. After flooding receeds and the overland flow system dries out, water will then be pumped from Holding Pond No. 1 to the overland flow system for treatment.

Construction Schedule

The construction of the recommended system cannot be completed by the July 1, 1974 date set by the NCRWQCB. An overland flow system requires 3 to 6 months to "mature", which places its completion late next summer or early fall.

For an interim solution, the following sequence is recommended:

1. Initiate design and installation of water conservation systems recommended by Eutek.
2. Negotiate with the Regional Board to receive additional time to implement operation of the recommended system.
3. Lease additional land for spray irrigation disposal of wastewater while new improvements are under construction.
4. Complete recommended improvements to the disposal system to comply with the Regional Board's discharge requirements.

The recommended improvements should be in full operation for the 1975 canning season.

SPRAY IRRIGATION ALTERNATIVE

As an alternative to the overland flow system recommended above, it is possible to use spray irrigation for the disposal of the wastewater. However, additional land is required to accommodate the peak wastewater flows during the late summer months. An additional 80 acres of land is available for lease or purchase

immediately east of the present disposal site. This would augment the present disposal system and the combined area will allow for disposal of approximately 436,000 gallons of wastewater per day based on an application rate of 0.20 inches per day.

The spray irrigation system can be used until the winter rains occur and the soil becomes saturated. At this time the spray irrigation should be terminated or discharges of untreated wastewater to the Laguna could occur. If spray irrigation is terminated, either supplementary holding and treatment facilities must be provided to accommodate the process wastewater or the canning operations must be shut down. If a holding pond is provided to capture the process wastewater and hold it until such time that it can be applied to the land, mechanical aerators should be provided in the pond to ensure aerobic conditions. Otherwise, the wastewater will become septic and cause serious odor problems. If a 5 million gallon capacity pond is provided, a minimum of six 15-hp mechanical aerators will be required to mitigate odors. These aerators could supply sufficient oxygen to control odors but would not completely treat the contents of the whole pond when filled. A 5 mg holding pond would provide approximately 35 days of storage based on a 150,000 gallons per day flow. A pumping station would also be required to pump from the pond into the irrigation system when the land is sufficiently dry to resume irrigation.

The estimated cost of the above described facilities, excluding land cost, the cost of the additional spray irrigation system, engineering, and contingencies is summarized below:

Holding pond, 5 mg	=	$25,000
Mechanical aerators	=	30,000
Irrigation pumping station	=	30,000
		$85,000

It should be recognized that these facilities have limited capacity and lack the flexibility of operation of the recommended system. During extended wet periods when the holding pond is full, it would be necessary to suspend canning operations.

Chapter 3
MONITORING OF SYSTEM

In this chapter, the necessary checks on system performance and operation are discussed. Samples of the effluent are needed to determine removal efficiencies and suitability for discharge. Samples of the soil are needed to ensure that no accumulations of harmful elements are occurring and that growing conditions for the grass cover are favorable.

The North Coast Regional Water Quality Control Board will establish the discharge requirements for the Sebastopol Industrial Wastewater Treatment Facility for the period when discharge is permitted. To comply with these requirements, the effluent entering the Laguna de Santa Rosa must be monitored to determine the adequacy of treatment as indicated by such parameters as levels of nutrients, pH, BOD_5, and suspended solids.

Samples should be taken on a weekly basis during the first 2 year's operation to provide an understanding of the system characteristics. Additional samples should be taken after changes in operation are made. The samples should be processed immediately so that necessary operational changes can be made to correct the situation if shortcomings are found.

The Barlow Company uses a caustic (NaOH) peeler in their operations. During the course of a day's operations, approximately 35,000 gallons of caustic rinse water is dumped into the industrial waste disposal system. This will be the main source of sodium to the disposal system and the soil.

Monitoring of effluent is the only way to obtain an indication of the operation of the disposal site and to help prevent pollution citations against the facility. The soil in the spray irrigation field and overland flow site should be analyzed once a year to make sure that a sodium buildup is not occurring and that conditions for growth of the ground cover are favorable. Sodium buildup is measured by the sodium adsorption ratio (SAR). A high SAR causes the soil structure to break down and the soil to become impermeable.

The concentrations of elements in the soil that must be obtained for the SAR are sodium, calcium, and magnesium. Other elements or items that should be monitored are total exchangeable cations, pH, organic matter, nitrogen, phosphorous, potassium, and the percent of base exchange capacity occupied by sodium, potassium, calcium, magnesium, and hydrogen.

One soil sample should be taken for every 15 acres of land area. Each sample should be a 1-quart composite of four random samples, each about 1-quart in volume, thoroughly mixed.

A sample from an adjacent plot of land should be taken to provide a control. This sample should be obtained from an area not irrigated with wastewater.

Chapter 4
ESTIMATED CONSTRUCTION COSTS

Nutrient Application	$ 4,000
Recycling Pumping Station No. 3	30,000
Recycling Pumping Stations No. 1 and No. 2	20,000
Holding Ponds	40,000
Overland Flow Site	30,000
Piping	30,000
Subtotal	$154,000
25% Contingencies	38,100
Subtotal	$192,100
15% Engineering and Administration	28,900
Subtotal	$221,000
Land Cost - $1,000/acre	35,000
Total	$256,000

The following paragraphs present a brief description of each of the items in the proposed system:

Nutrient Application. Install 900-lb-per-day ammoniator and appurtenant equipment as shown in Figure 4, utilizing Recycling Pumping Station No. 3.

Recycling Pumping Station Nos. 1 and 2. Construct pumping stations No. 1 and No. 2 at locations shown in Figure 1. Both stations should have two 50-gpm submersible pumps installed in a wetwell. The electrical controls should be suitable for submergence. The force mains should be 2-inch PVC pipe routed as shown in Figure 1.

Recycling Pumping Station No. 3. Construct pumping station No. 3 between Holding Ponds 1 and 2 so as to draw water out of either pond. Construct 3-inch force main to overland flow treatment site. The two 100-gpm turbine pumps and electrical controls should be suitable for submergence.

Holding Ponds. Construct holding ponds to the east of the existing spray irrigation field. The ponds shall have the following capacities: No. 1 - 8 acre-ft (2.6 million gallons); No. 2 - 20 acre-ft (6.5 million gallons). The side slopes of the earth embankments should be no steeper than 2.5 on 1. A 6-inch drain from Holding Pond No. 2 to the Laguna should be provided for discharge during the winter months.

Overland Flow Site. Construct a 10.5-acre overland flow facility in three benches. Each bench will have one row of ten 10-gpm sprinklers near the top of the bench slope. A 150 to 200-foot slope at 2 percent is desirable to provide the treatment. The effluent will be collected in a ditch that will carry the water to pumping station No. 2.

Chapter 5
CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Additions and modifications to the existing spray irrigation system are needed to comply with the North Coast Regional Water Quality Control Board requirement of no discharge to the Laguna de Santa Rosa from May 15 to September 30.

2. It is not feasible to completely contain wet-weather flows to land. A treatment system is needed to meet wet-weather requirements.

3. Additional treatment by overland flow is needed to permit discharge of effluent from September 30 to May 15.

4. Holding ponds are needed to contain excess amounts of wastewater when flow is excessive and when discharge is prohibited.

5. Implementation of water conservation measures suggested by Eutek will aid in the reduction of flow and avoid overloading the site.

6. The existing spray irrigation system should be retained and used during the summer at a loading rate not to exceed the consumptive use rate of the growing crop.

7. Monitoring of the discharge is necessary to determine system performance.

8. Soil samples should be taken yearly to determine the sodium content.

9. The improvements recommended will not be completed by July 1974 and additional land will be required to be leased for effluent disposal during the summer of 1974. Potable irrigation equipment should be used as a temporary measure.

10. Work on the overland flow system should commence as soon as possible so the installation is operable at the earliest possible date.

Recommendations

1. Construct overland flow treatment site, holding ponds and appurtenant work for a complete year-round treatment system.

2. Reduce wastewater volumes to ensure that the disposal capacity of the existing irrigation field is not exceeded and to keep the size of the land treatment system to a minimum.

3. Provide adequate management and maintenance for the land treatment site.

4. Monitor discharge to Holding Pond No. 2 for compliance with discharge requirements, and monitor the sodium content of the soil.

5. Establish a better growth of cover crop on the spray irrigation site.

6. Reduce the concentration of sodium hydroxide (caustic) in the wastewater to an absolute minimum.

7. Review results of this study with the North Coast Regional Water Quality Control Board with the view of obtaining a time extension for completion of the recommended system.